



# **Third Annual Climate Change Research Conference**

**Energy Commission Climate Research— where  
we've been and where we're going...**

**Kelly Birkinshaw and Guido Franco  
September 13, 2006**



# **Policy relevance primary focus for Climate Change Research Program**

## **Primary Goal:**

Improve the state-of-science/art relative to climate change and its physical and economic impacts on California. Produce policy relevant research that will allow the state to develop sound emissions reduction, and adaptation/coping strategies.



# Key Questions Guide the Research Agenda

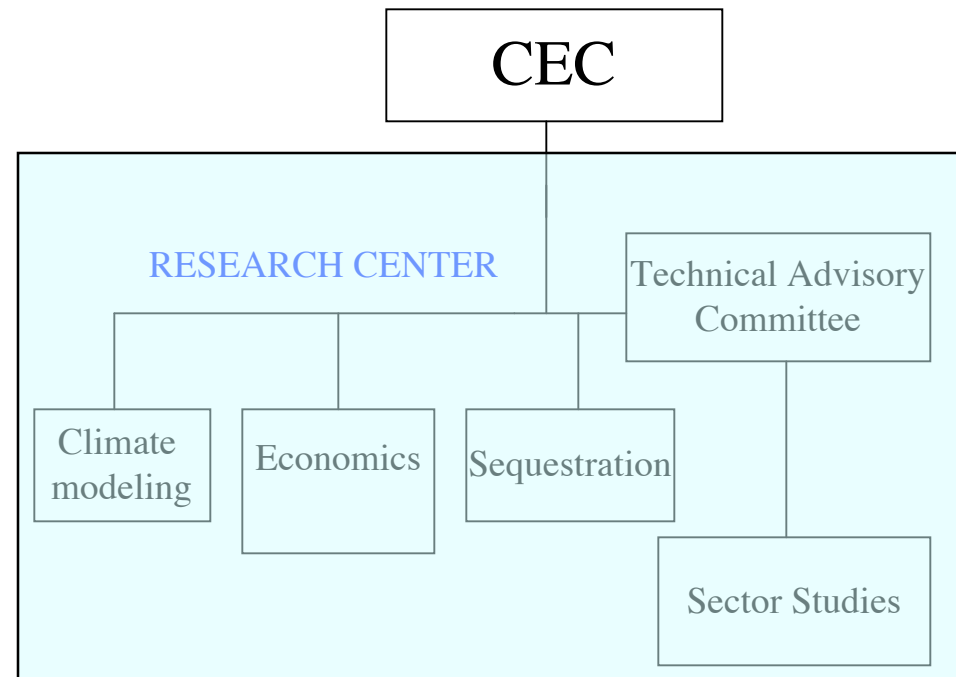
## Guiding questions:

- What are plausible climate change scenarios for California?
- How would physical impacts of climate change affect the environment and economy?
- How would climate change affect vulnerable infrastructure?
- What are the least-cost strategies for reducing emissions?
- What are the relative merits of alternative adaptation/coping strategies?
- How would climate change policies affect the overall economy?



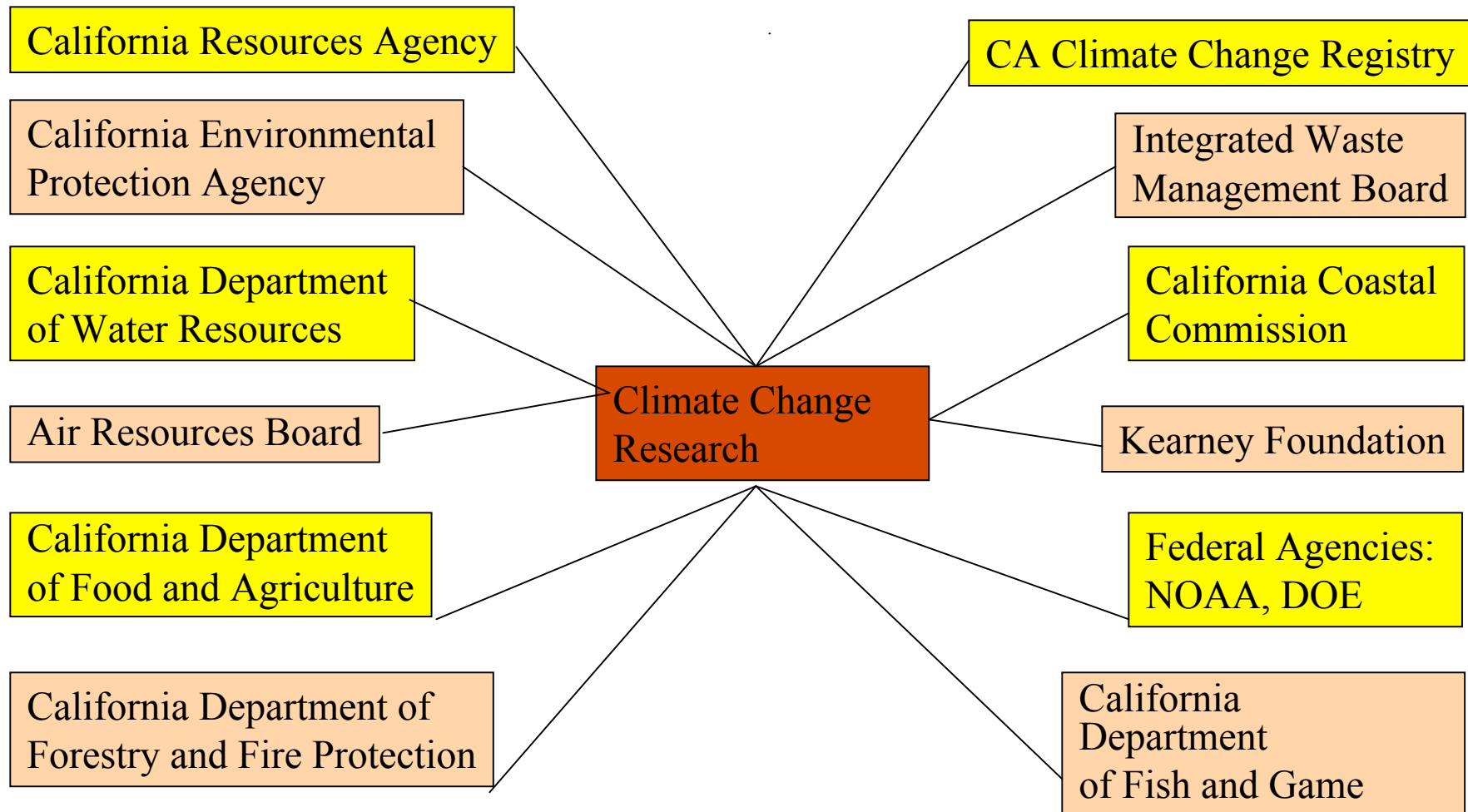
# Research Agenda Integrated through Virtual Center

- Climate monitoring, analyses, and modeling
- Social and economics studies of mitigation and adaptation
- Regional terrestrial and geologic carbon storage potential
- Sector studies (e.g. Dynamic Ecological Modeling) not addressed by the Core Program





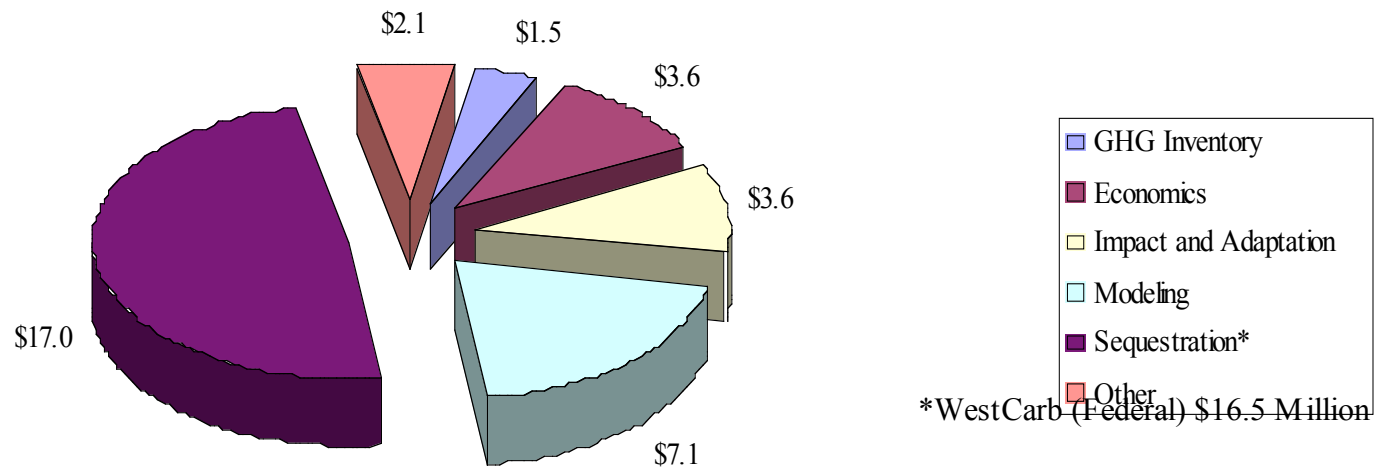
# Collaboration is Critical to the Success of the Program





# Climate Change Research Investment

Approximately \$5 million is allocated each year to climate change research.

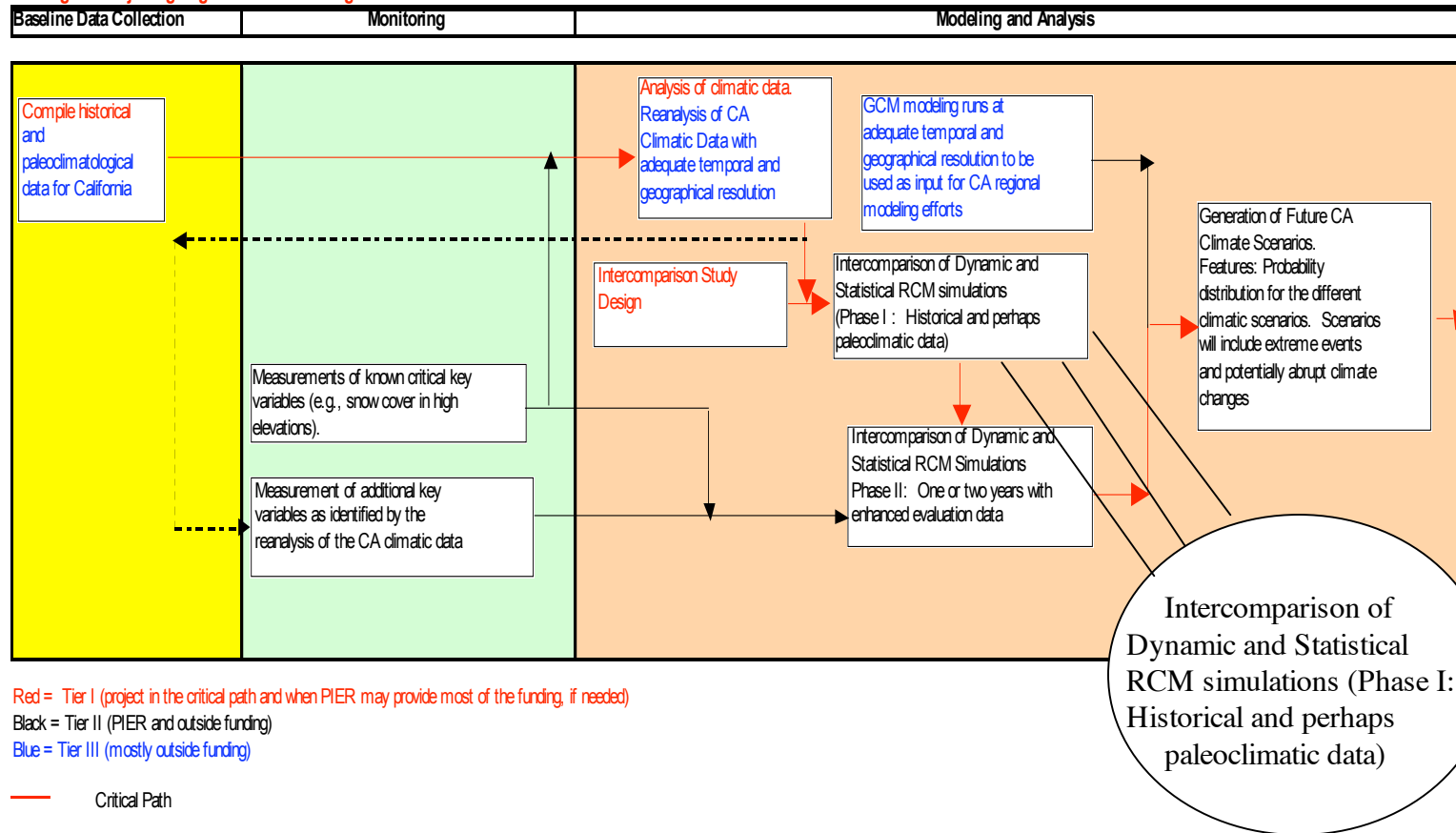


Total Investment: \$34.9 million



# Critical Path Analysis Forms of Framework for Implementing the Plan

## Sensing and Projecting Regional Climate Change in California





# Accomplishments

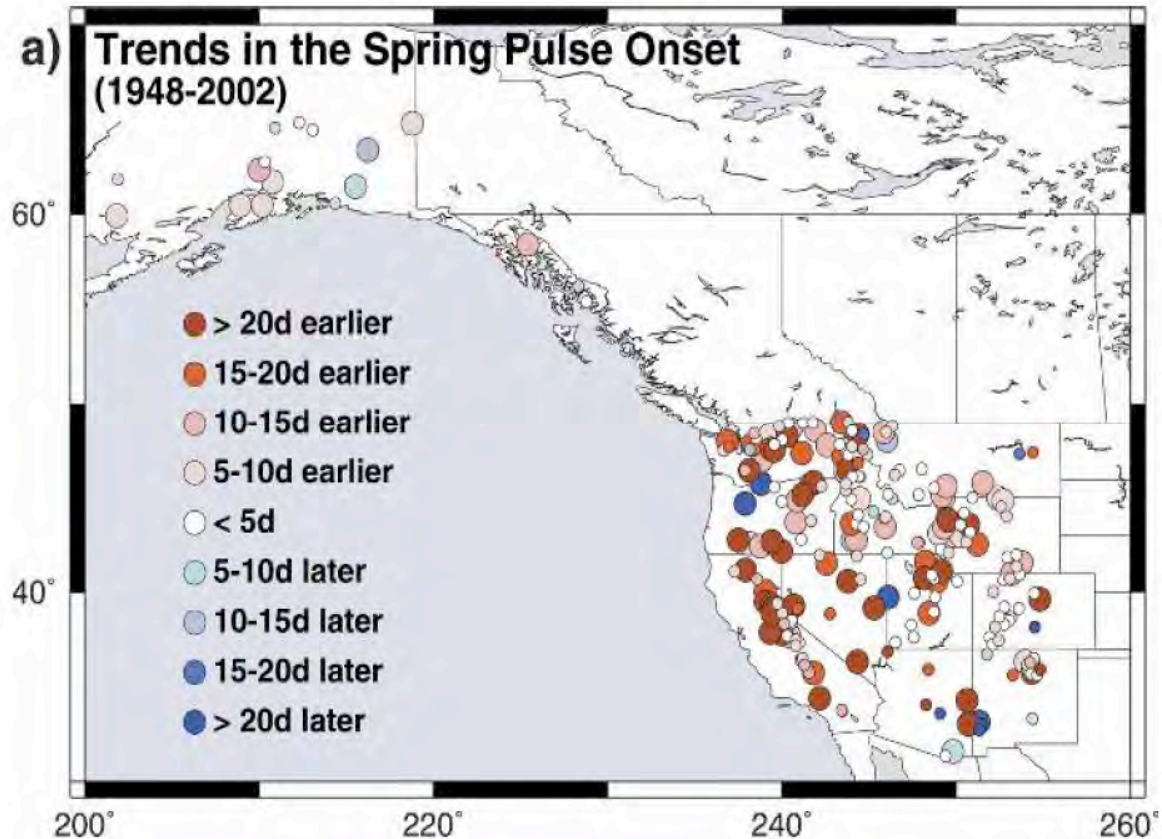




# Is Early Melting of Snow a Signal of Climate Change?

- Reported as a major new scientific finding in 2005 by the World Resources Institute

**Climate science 2005: Major new discoveries**  
2006, ISBN: 1-56973-608-1  
K. Levin and J. Pershing  
WRI

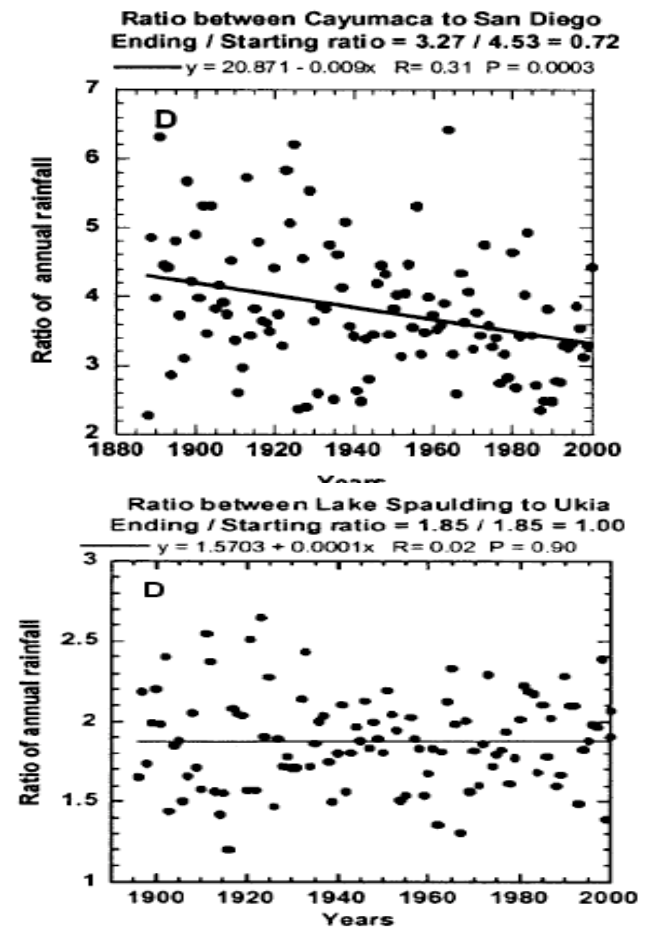


Source: Stewart, et al. Journal of Climate. Volume 18. April 2005



# Aerosols and its Precursors seem to affect precipitation levels

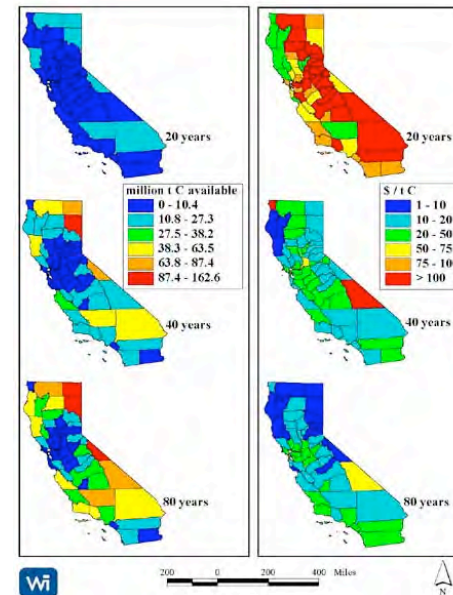
- This research increased scientific interest on the effect of aerosols on orographic precipitation
- Similar effects have been shown in Oregon and Washington and other parts of the world
- NASA is now funding a follow-up project involving the use of the enhanced tools developed for PIER





# Offsetting GHG Emissions through Carbon Sequestration

- Research contributed to the development of the monitoring and verification protocols adopted by the CA Action Registry
- Example of collaboration between state agencies (CDF and CEC)
- Provided the information needed for the CAT report



**Methods for Measuring and Monitoring  
Forestry Carbon Projects in California**  
(Publication # 500-04-072F).  
Posted December 1, 2004.

**Carbon Supply From Changes In Management of  
Forest, Range, and Agricultural Lands of California**  
(Publication # 500-04-068F). Posted December 6,  
2004.



# Research Conducted by the Center is making a difference

## Climate Action Team Report to Governor Schwarzenegger & the Legislature (March 2006)

- The Climate Change Center produced the Scenario Analysis
- The Scenario Analysis, produced in a very short time frame, was well received
- Producing this analysis was only possible due to the fundamental research supported over last few years





# **Major Trends and Drivers Will Guide Future Research**

But we need to balance limited budget,  
timeframes, and risk!



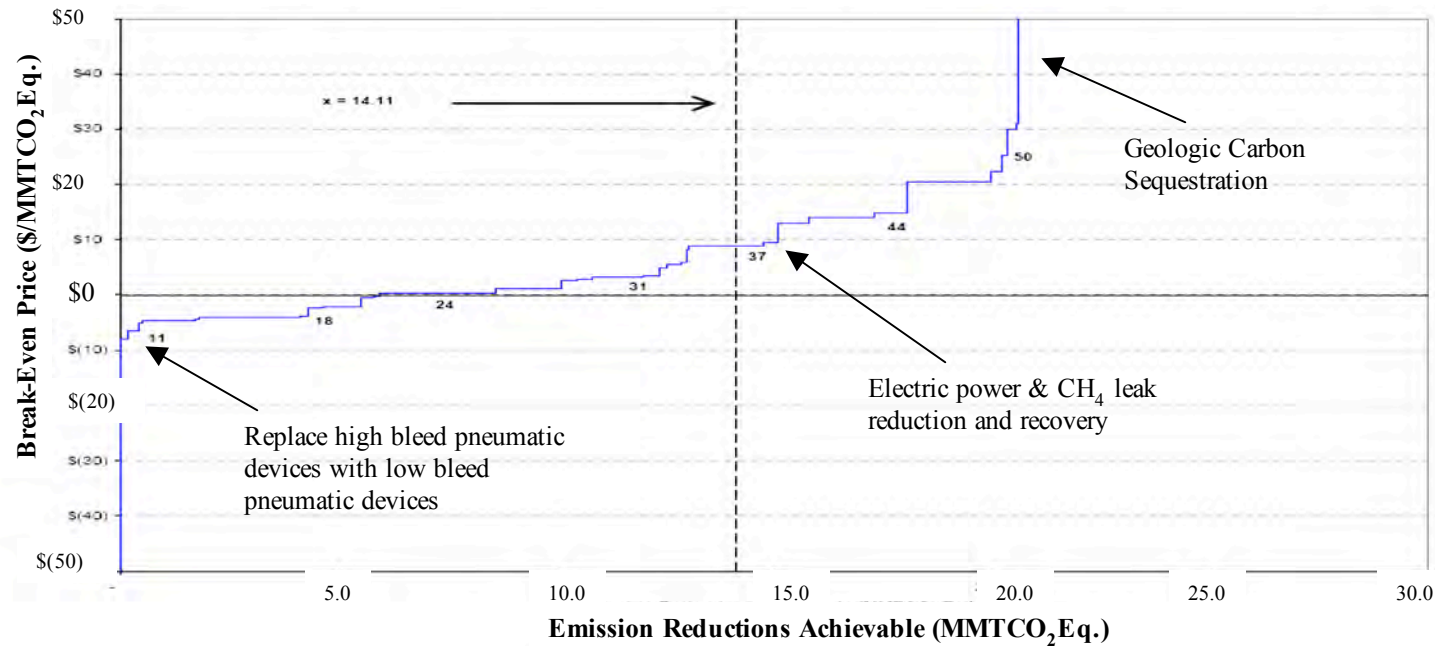
## **Reduction Targets in Law and Executive Order are a Primary Driver**

- **Assembly Bill 32**
  - 1990 emissions levels by 2020
- **Executive Order S-3-05**
  - 2000 emissions levels by 2010
  - 1990 levels by 2020
  - 80 percent below 1990 levels by 2050



# Establishing a Comprehensive Carbon Management Strategy

MACC for California in 2010, Cumulative Reductions Available for Zero Net Cost (DR=4%, TR=0%)



- There is no silver bullet
- Non-CO<sub>2</sub> gases may be a partial but cost-effective option

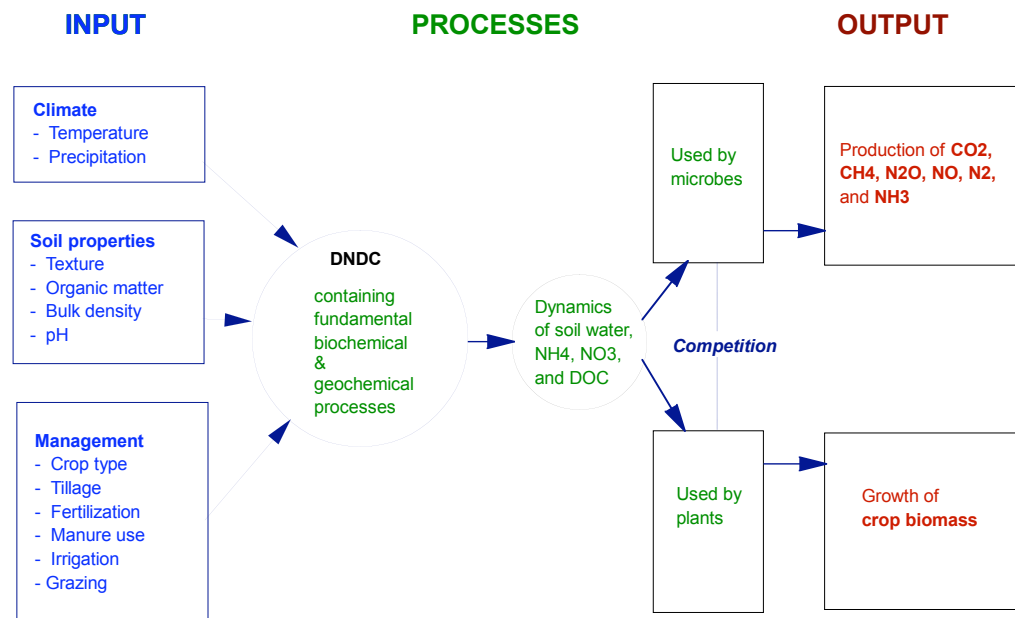




# Large uncertainty in GHG Emissions Inventory

- Existing inventory developed from a “top down” approach
- Largest uncertainty in non-CO<sub>2</sub> gases
- Industry-specific “process” modeling is promising solution
- Reverse ambient air modeling could provide validation

DNDC Links Ecological Drivers to Crop Yield/Trace Gas Emission

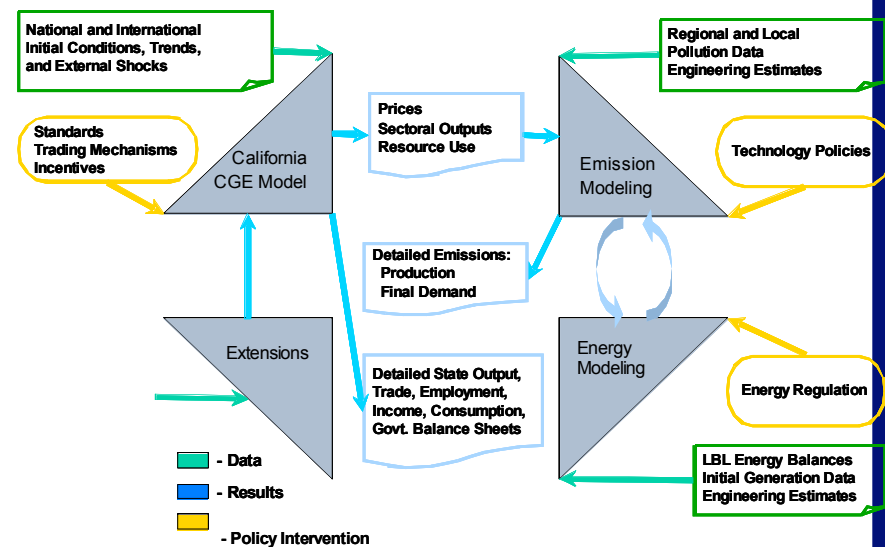






# Development of Tools for Economic analyses : mitigation, impacts, adaptation

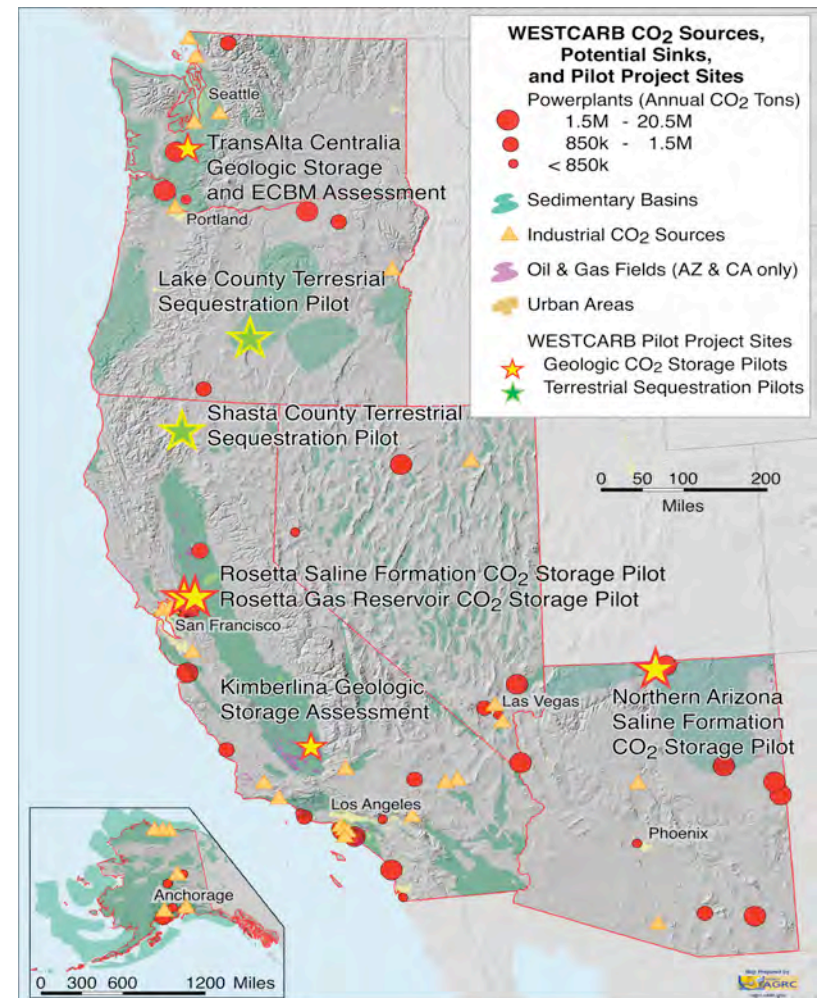
- Several tools are under development
- Among them is the a dynamic macro-economic model of the state economy designed for climate change studies





# West Coast Regional Carbon Sequestration Partnership

- WESTCARB is a partnership of over 70 organizations led by the California Energy Commission.
- WESTCARB's Phase II activities include 5 geologic and 2 terrestrial CO<sub>2</sub> sequestration pilots in California, Arizona, Oregon, and Washington over a four-year period
- Pilots are representative of the best sequestration options, unique technologies, and approaches, in the region
- Pilots involve site-specific focus for
  - Testing technologies
  - Assessing capacity
  - Defining costs
  - Assessing leakage risks
  - Gauging public acceptance
  - Testing regulatory requirements
  - Validating monitoring methods





## Growing Recognition of the need for Long-term Strategic Planning

*“Given the serious potential consequences of climate change on the State’s resources, California should expand its support of climate change research to create the tools, methods, and information that will be needed to develop robust coping and adaptation strategies in the state”*

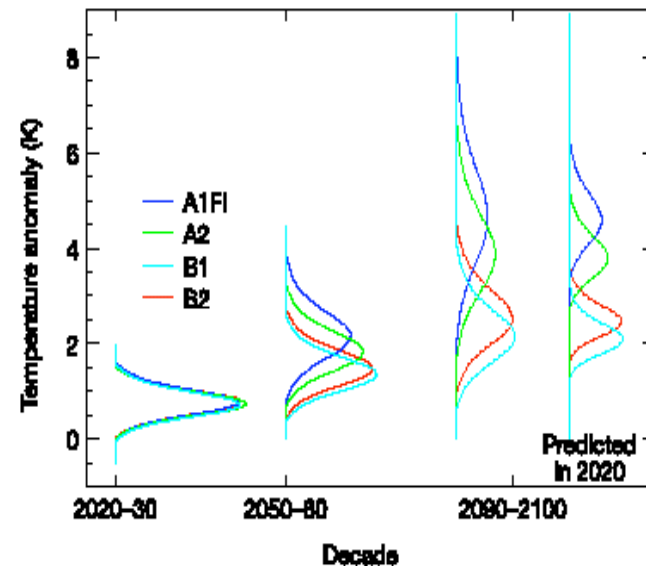
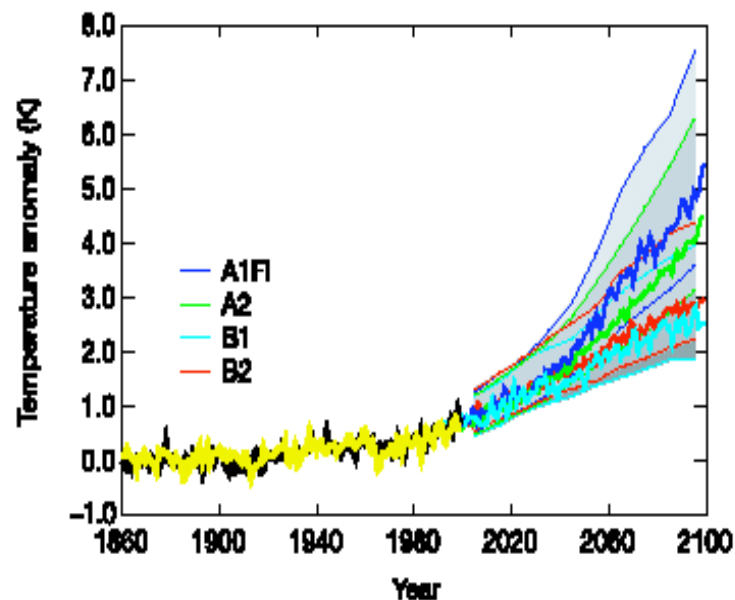
**-2006 Climate Action Team Report to the Governor**



# Identifying “likely” Climate Scenarios is Critical to Strategic Planning

**It is impossible to establish adaptation measures:**

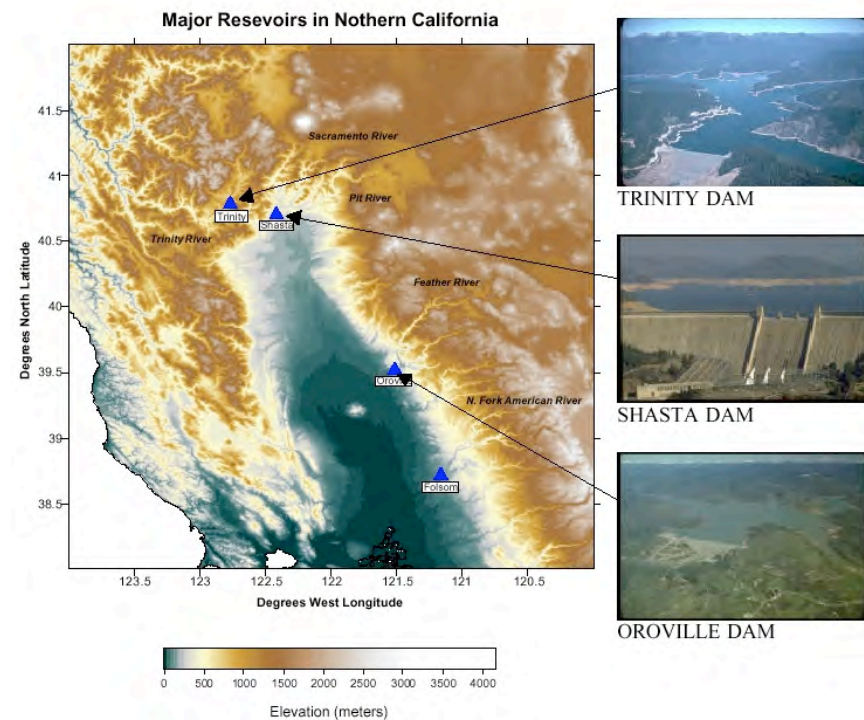
- from course scale modeling
- a wide range of equally plausible scenarios.





# Use of Probabilistic Forecasts for the Reservoir Management: an adaptation strategy

- The use of probabilistic forecasts and decision support can increase operation efficiency of the water system.
- The same approach can be used to address increased climate variability



INFORM Project



## **Research products will provide valuable, integrated strategic data and analysis**

- Probabilistic Climate Scenarios
- Impacts to critical energy, water and ecological resources and infrastructure
- Supply curves for reducing/mitigating GHG emissions
- Improved dynamic economic modeling of possible reduction and adaptation/coping strategies
- Analytical tools for adaptation studies





# Thank-You!

## For More Information

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**Visit the PIER Research website at:**  
[www.eenergy.ca.gov/pier/energy/index.html](http://www.eenergy.ca.gov/pier/energy/index.html)